OPERATING SUMMARY

KINGSTON TWP.

1972

Ontario

Ministry of the
Environment

135 St. Clair Avenue West
Toronto 195, Ontario

We are pleased to present you with the 1972 operating summary for the water pollution control plant serving your community.

This summary contains data on the performance of the plant as well as relevant financial information. Of particular interest is the review of the year's activities in which significant items of these data are discussed in some detail by the operations engineer and his staff who, by their day-to-day involvement with the operation, are thoroughly familiar with the plant.

We appreciate your continuing interest in protecting the environment through the efficient operation of this wastewater treatment facility.

D.S. Caverly,
Assistant Deputy Minister.

D.A. McTavish, P. Eng.,
Director,
Project Operations Branch.

MINISTRY OF THE ENVIRONMENT

MINISTER
Honourable James A. C. Auld

DEPUTY MINISTER
E. Biggs

ASSISTANT DEPUTY MINISTER
D. S. Caverly

EXECUTIVE DIRECTOR
K. H. Sharpe

PROJECT OPERATIONS BRANCH

DIRECTOR
D. A. McTavish

ASSISTANT DIRECTOR
C. W. Perry

ACTING REGIONAL SUPERVISOR
B. W. Hansler

OPERATIONS ENGINEER
J. Dick

135 St. Clair Avenue West
Toronto 195

KINGSTON TWP.

WATER POLLUTION CONTROL PLANT

operated for

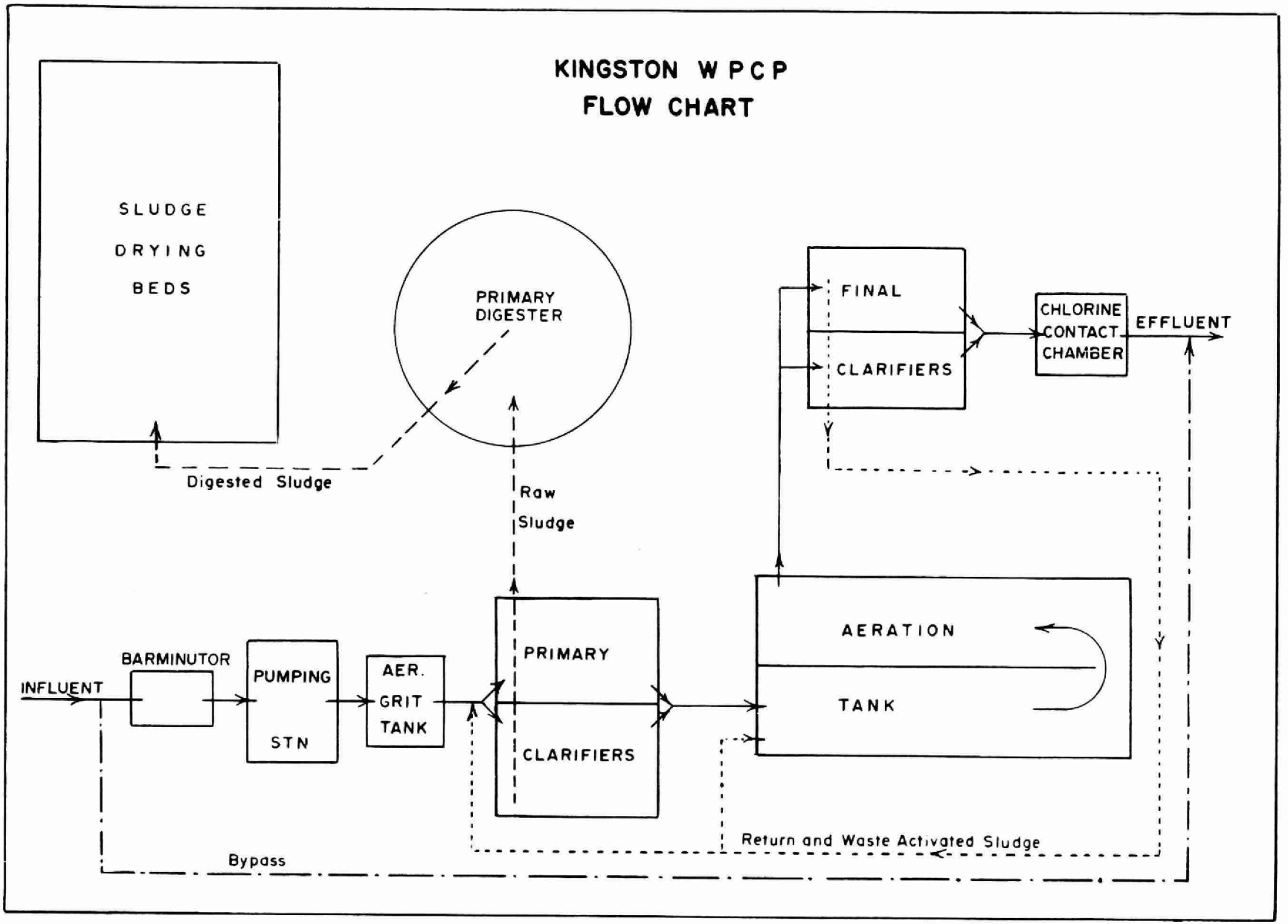
THE TOWNSHIP OF KINGSTON

by the

MINISTRY OF THE ENVIRONMENT

1972 ANNUAL OPERATING SUMMARY

CONTENTS


KINGSTON W P C P
FLOW CHART
SLUDGE
DRYING
BEDS
PRIMARY
DIGESTER
FINAL
CLARIFIERS
CHLORINE
CONTACT
CHAMBER
EFFLUENT
Digested Sludge
Raw
Sludge
AERATION
TANK
BARMINUTOR
INFLUENT
PUMPING
STN
AER.
GRIT
TANK
PRIMARY
CLARIFIERS
Return and Waste Activated Sludge
Bypass

DESIGN DATA

PROJECT NO.	2-0098-61
TREATMENT	Activated Sludge
DESIGN FLOW	0.83 mgd
DESIGN POPULATION	10,000
BOD - Raw Sewage	210 mg/l
SS - - Raw Sewage	250 mg/l

PRIMARY TREATMENT

Comminution

Type: C.P. Barminutor
Size: One Model C (18')

Sewage Lift Pumps

Type: Weinman Type VBM
Size: Two 1200 gpm @ 35' tdh

Grit Removal

Type: Aerated; grit removed by air lift
Size: 1920 gal
Retention: 2 min

Primary Sedimentation

Type: Falk
Size: Two 46' x 12' x 7'7" deep (8,380 cu ft or 52,200 gal)
Retention: 1.5 hours
Loading: Surface, 750 gal/ft^2/day
Weir, 8,600 gal/ft/day

SECONDARY TREATMENT

Aeration Tanks

Type: Diffused air; Two-pass
Size: One tank 62' x 22.5' x 15' (each pass) (41,900 cu ft or 262,000 gal)
Retention: 7.6 hours

Air Supply

Type: Roots-Connersville
Size: Two 880 scfm

Diffusers

Type: C.P. Discfuser
Space: 63 diffusers per pass (wide band)

Secondary Sedimentation

Type: Falk
Size: Two 56' x 12' x 9' deep (12,100 cu ft or 75,600 gal)
Retention: 2.2 hours
Loading: Surface, 562 gal/ft^2/day
Weir, 5,050 gal/ft/day

CHLORINATION

One W & T (100 lb/day)

Chlorine Contact Chamber

Size: One 27' 9" x 9' x 8' deep (10,300 gal)
Retention: 18 min

OUTFALL

3,000 ft to Lake Ontario

SLUDGE HANDLING

Digestion System

Type: Single stage, mixed by sludge recirculation
Size: One 55' dia x 20' swd (54,500 cu ft or 340,000 gal)
Loading: 0.57 lb/cu ft/mo
Recirculation pump - one Weinman: 150 gpm @ 65'

Sludge Drying Beds

Four 80' x 20' (6,400 sq ft)

'72 Review

GENERAL

In 1972 a total of 549 million gallons of sewage were treated at the Township of Kingston water pollution control plant. This represents an average daily flow of 1.50 million gallons per day. This is almost twice the hydraulic design flow of the plant which is 0.83 million gallons per day. Although the average daily flow is considerably higher than the design flow, the pumping stations within the sewage collection system have no difficulty in handling the normal sewage flows. Difficulty is experienced with large flows at pumping stations #1 and #3 during periods of intense rain storms due to rain water entering the sewage collection system.

To alleviate the overloaded condition at the plant during 1972 a polyelectrolyte was tried to ascertain whether this would improve the separation of sludge in the final settling tanks. Since the laboratory determinations indicated that it would be successful, a small chemical pump was purchased plus enough polyelectrolyte to try this on a plant scale. Again the plant scale turned out to be satisfactory and it became evident that this procedure would have to be continued throughout the year. Although the polyelectrolyte is rather expensive it is providing better treatment during the present overloaded conditions and it is felt that this additional cost is justified. The Airport road pumping station was enlarged by the installation of new impellers and new motors. The new motors and control system were supplied by Marathon Electric and are based on a new principle of variable speed pumping. The new impellers were supplied by Fairbanks Morse and are the largest impellers that can be fitted into the existing pumps. Although the unit is rather complex it has proven to be very satisfactory. Because of the increased heat given off by these new motors an exhaust fan was installed in pumping station #2 to cool the station during the summer months.

The original bar screens that were installed in pumping station #2 and #3, have not operated very satisfactorily. Consequently, new bar screens were installed in both the #2 and #3 pumping station wet wells during the year. This has greatly increased the removal of rags from these wet wells with the result that less plugging of the pumps have occurred.

A request was received during the year from the Royal Military College requesting that a pilot plant be set up on the plant site for experimental purposes. This request was approved and during the months of July and August, a pilot plant was constructed and operated. The study entailed the use of alum sludge from the water treatment plant to observe the effect on the removal of phosphate from the waste. This study was conducted by Professor J. D. O'Blenis from the Royal Military College and Assistant Professor T. R. Warriner from Queens University.

A Flowmatcher unit is used at both pumping stations #1 and #3 to operate the pumps. The Flowmatcher unit utilizes stainless steel plates which from time to time must be replaced. Both Flowmatcher plates were replaced in pumping stations #1 and #3.

The cost of sludge disposal was considerably greater in 1972 than in previous years. This was due primarily to the rather wet year in which the sludge drying beds could not be used and this of course necessitated the disposal of liquid digested sludge by tank trucks.

The quality of the plant effluent which was 46 mg/l and 53 mg/l BOD and suspended solids respectively, does not meet this Ministry's standards. This is caused by the overloaded condition of the plant and can only be corrected by plant expansion.

The water pollution control plant was visited by various groups from local schools and colleges from the area.

Since the tables and graphs in this report are self-explanatory, no comments will be made in this regard.

CONCLUSIONS

Because of the high flows that occur during periods of rain storms, every effort should be made to locate the points of entry and to eliminate this source. Because of the grossly overloaded condition of the plant, both hydraulically and organically, every effort should be made to enlarge the plant as soon as possible.

PROJECT COSTS

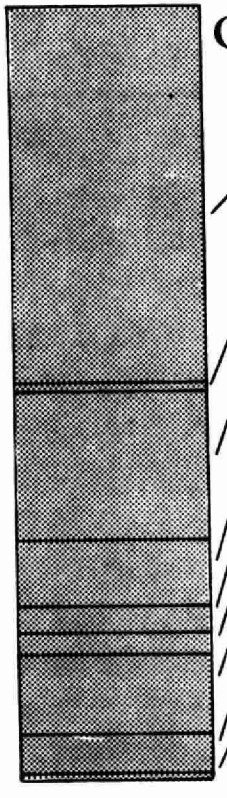
NET CAPITAL COST	$1,531,682.15
DEDUCT - Portion financed by CMHC (Final)	(431,721.56)
MUNICIPAL ADVANCES	(156,782.00)
Long Term Debt to MOE	$ 943,178.59
Debt Retirement Balance at Credit (Sinking Fund) December 31, 1972	$ 124,526.91
Net Operating	$ 64,451.88
Debt Retirement	17,039.00
Reserve	8,493.92
Interest Charged	52,892.48
TOTAL	$ 142,877.28

RESERVE ACCOUNT

Balance @ January 1, 1972	$ 43,702.25
Deposited by Municipality	8,493.92
Interest Earned	2,733.48
	$ 54,929.65
Less Expenditures	10,000.00
Balance @ December 31, 1972	$ 44,929.65

1972 COSTS

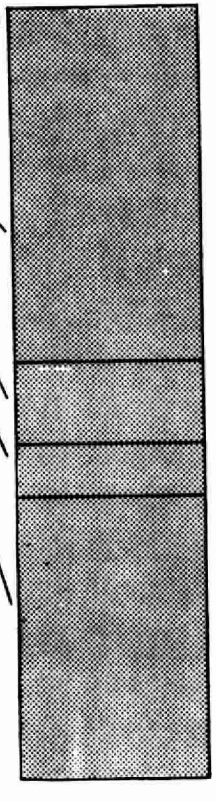
OPERATING COSTS



PAYROLL	48 %
FUEL	1 %
POWER	19 %
CHEMICALS	9 %
GENERAL SUPPLIES	4 %
EQUIPMENT	2 %
REPAIRS & MAINTENANCE	10 %
SUNDRY	7 %
WATER	NIL %
TRAVEL	1 %

TOTAL ANNUAL COST

NET OPERATING	45 %
DEBT RETIREMENT	12 %
RESERVE	6 %
INTEREST	37 %



YEARLY OPERATING COSTS

YEAR	SEWAGE TREATED in million gallons	TOTAL OPERATING COSTS	TREATMENT COSTS	
			$ per million gal	¢ per lb BOD
1968	314.02	36,455.90	116.09	2 cents
1969	345.0	39,254.02	113.78	3 cents
1970	408.3	44,857.18	109.90	7 cents
1971	454.5	51,491.27	113.30	8 cents
1972	549.3	64,451.88	117.30	5 cents

MONTHLY OPERATING COSTS

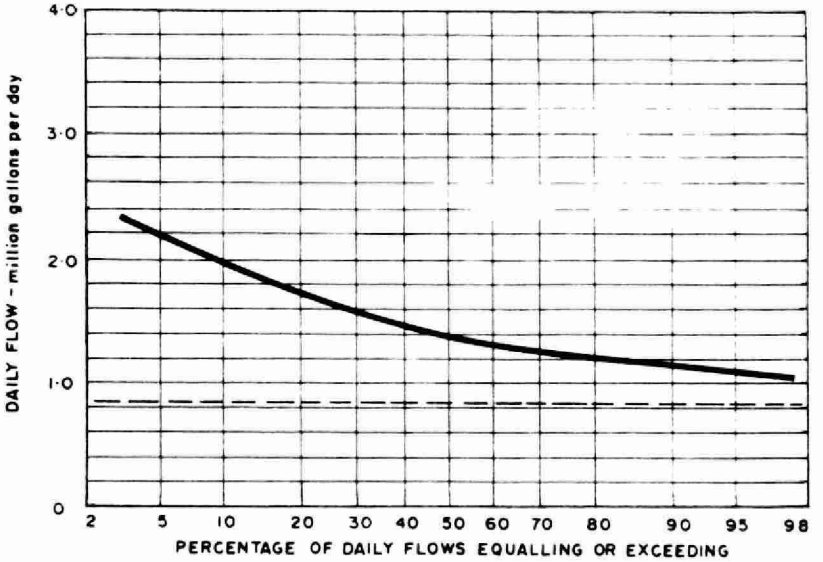
MONTH	TOTAL EXPENDITURE	REGULAR PAYROLL	CASUAL PAYROLL	FUEL	POWER	CHEMICALS	GENERAL SUPPLIES	EQUIPMENT	REPAIRS and MAINTENANCE	SUNDRY*	WATER	TRAVEL
JAN	3270.20	2132.65			963.54		28.97			145.04		
FEB	4206.36	2219.01		103.80	1113.52		297.46	170.52	189.14	61.55		51.36
MAR	4760.86	2153.88		103.80	937.25		212.44	866.25	206.97	280.27		
APR	3738.03	2282.81			1044.96		108.88		192.43	108.95		
MAY	5506.63	2396.61			1243.41	1113.84	268.65		352.17	131.95		
JUNE	5049.77	3259.63	281.64	122.86	977.17		258.22		64.68	85.57		
JULY	3441.55	47.48					157.26	250.10	1883.48	1103.23		
AUG	2953.89	2206.58	242.65			264.00	115.35		101.17	24.14		
SEPT	6835.11	2231.93	286.81		3203.50	270.00	29.88	20.10	146.39	646.50		
OCT	6041.51	2533.66	24.94		748.67	2118.00	226.00		62.31	327.93		
NOV	2114.45	97.28				1014.00	149.00	33.10	137.70	683.37		
DEC	16533.52	8301.88	217.54	178.91	1854.54	777.00	709.44	202.32	2973.60	1132.84		185.45
TOTAL	64451.88	29863.40	1053.58	509.37	12086.56	5556.84	2561.55	1542.39	6310.04	4731.34		236.81

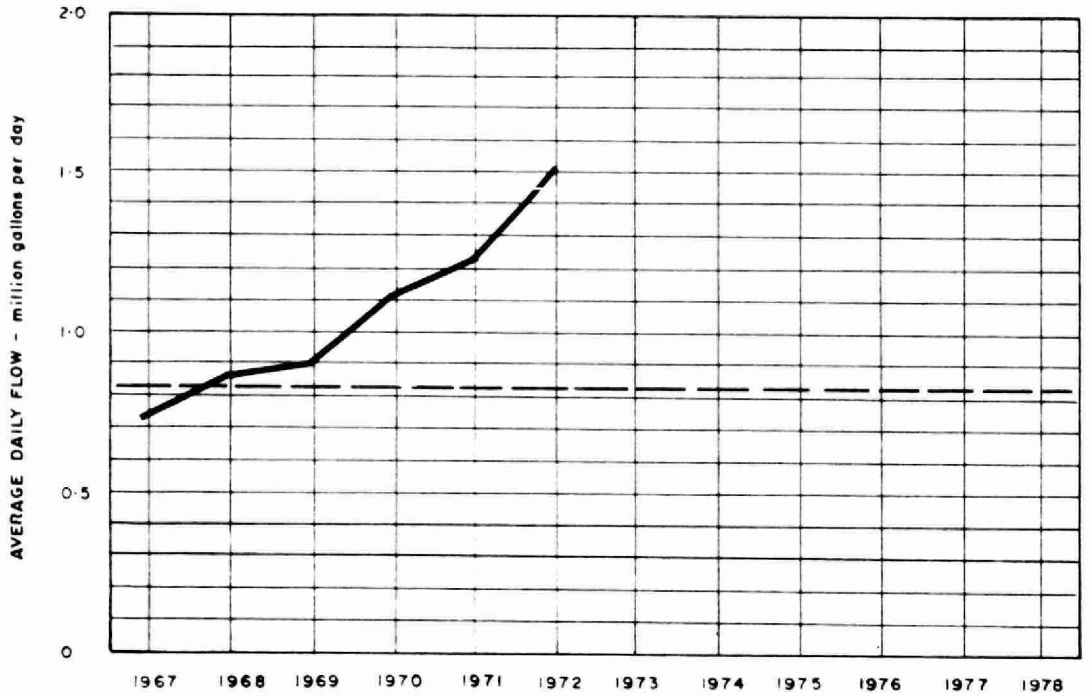
Brackets indicate credit.

* Sundry includes sludge haulage costs of $1408.50

PROCESS DATA

FLOWS



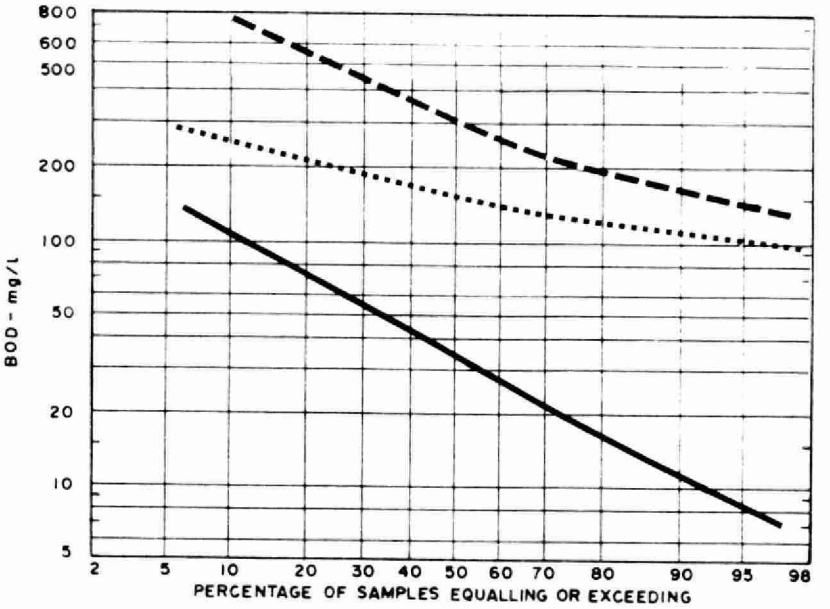


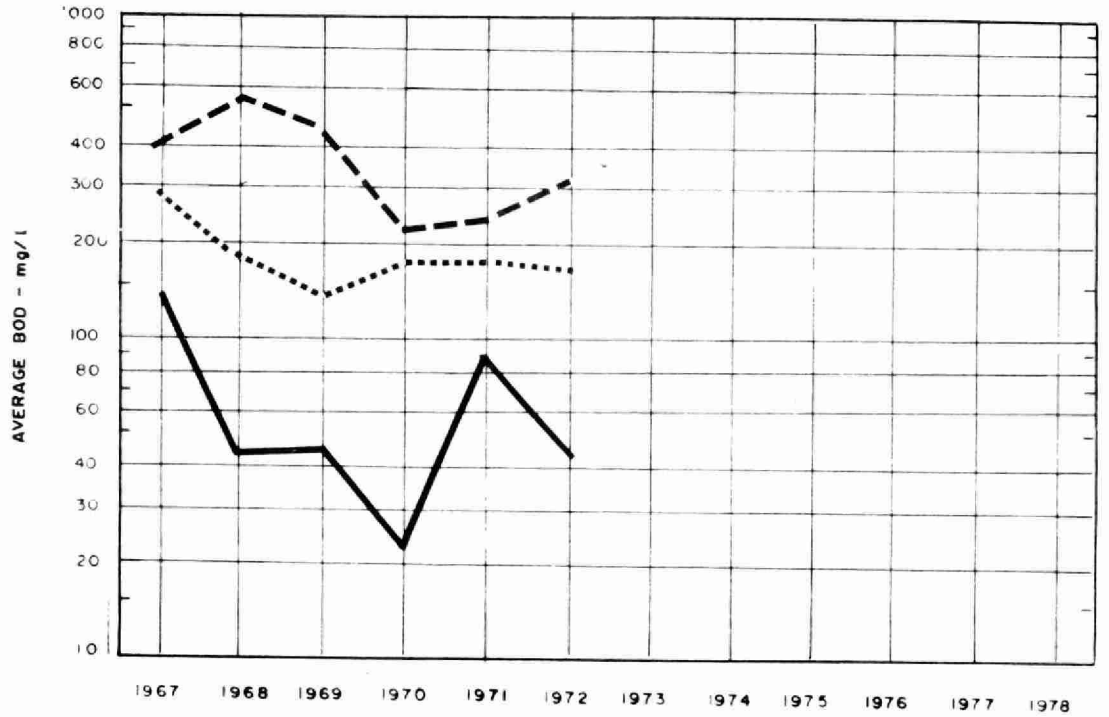
DESIGN CAPACITY _ _ _ _ _ _ _

PLANT PERFORMANCE

MONTH	FLOWS			BIOCHEMICAL OXYGEN DEMAND				SUSPENDED SOLIDS				PHOSPHORUS	
	TOTAL FLOW	AVERAGE DAY	MAXIMUM DAY	INFLUENT	EFFLUENT	REDUCTION		INFLUENT	EFFLUENT	REDUCTION		INFLUENT	EFFLUENT
	million gallons	mil. gal	mgd	mg/l	mg/l	%	10^3 pounds	mg/l	mg/l	%	10^3 pounds	mg/l P	mg/l P
JAN	40.5	1.31	2.0	473	98	79	152	493	124	75	149	20	5.5
FEB	34.9	1.20	2.3	315	25	92	101	348	22	94	114	14	2.2
MAR	47.3	1.52	2.5	376	13	97	172	411	11	97	189	12	1.9
APR	57.1	1.90	2.4	192	11	94	103	153	9	94	82	8	2.9
MAY	49.2	1.59	2.2	218	15	93	100	221	14	94	102	10	8.4
JUNE	48.3	1.61	2.4	201	20	90	87	257	56	78	97	10	6.8
JULY	40.9	1.32	1.6	357	31	91	133	251	34	86	89	10	2.8
AUG	45.5	1.47	2.2	305	92	70	97	304	117	62	85	11	9.2
SEPT	37.4	1.25	2.2	606	92	85	192	1068	73	93	372	31	
OCT	51.7	1.67	2.4	318	64	80	131	331	66	80	137	13	5.3
NOV	48.6	1.62	2.4	248	91	63	76	229	56	76	84	8	4.6
DEC	48.0	1.55	2.3	199	41	79	76	179	69	61	53	10	5.3
TOTAL	549.4	-	-	-	-	-	1420	-	-	-	1553	-	-
AVG.		1.50	MAXIMUM 2.5	312	46	85	118	357	53	85	129	13	4.3
No. of Samples	-	-	-	68	69	-	-	61	62	-	-	19	18

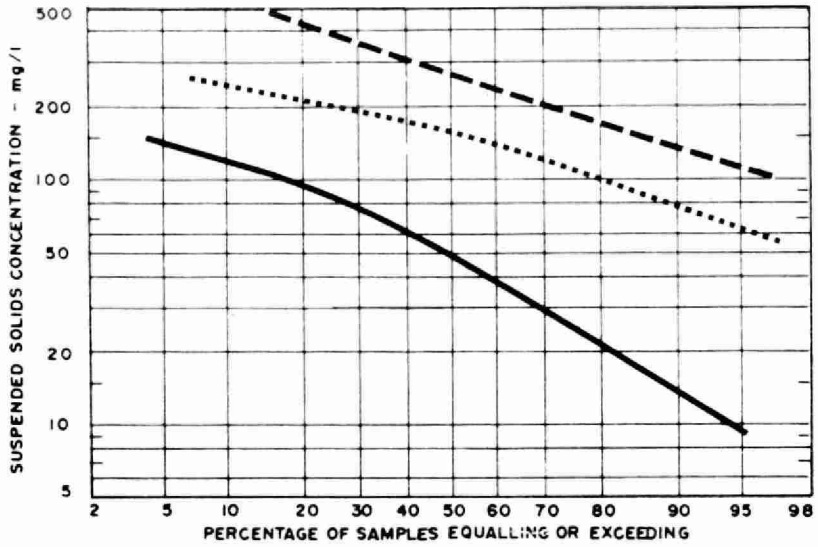
BIOCHEMICAL OXYGEN DEMAND

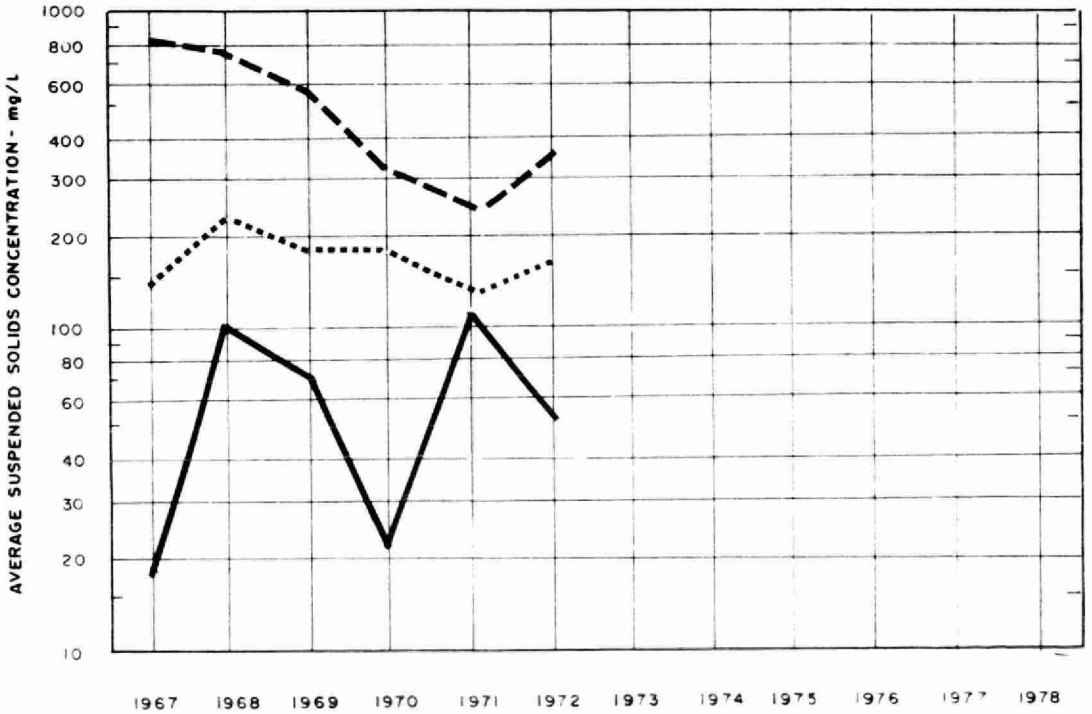




PLANT INFLUENT
PRIMARY EFFLUENT
PLANT EFFLUENT

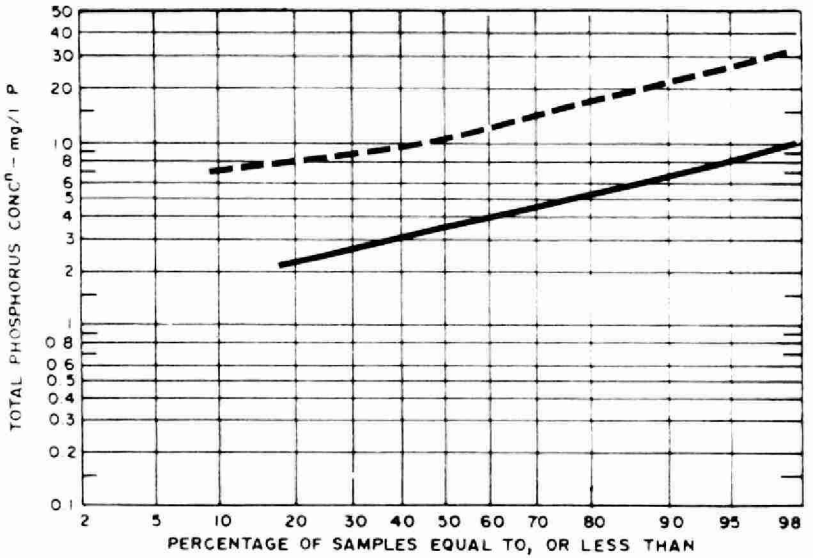
SUSPENDED SOLIDS

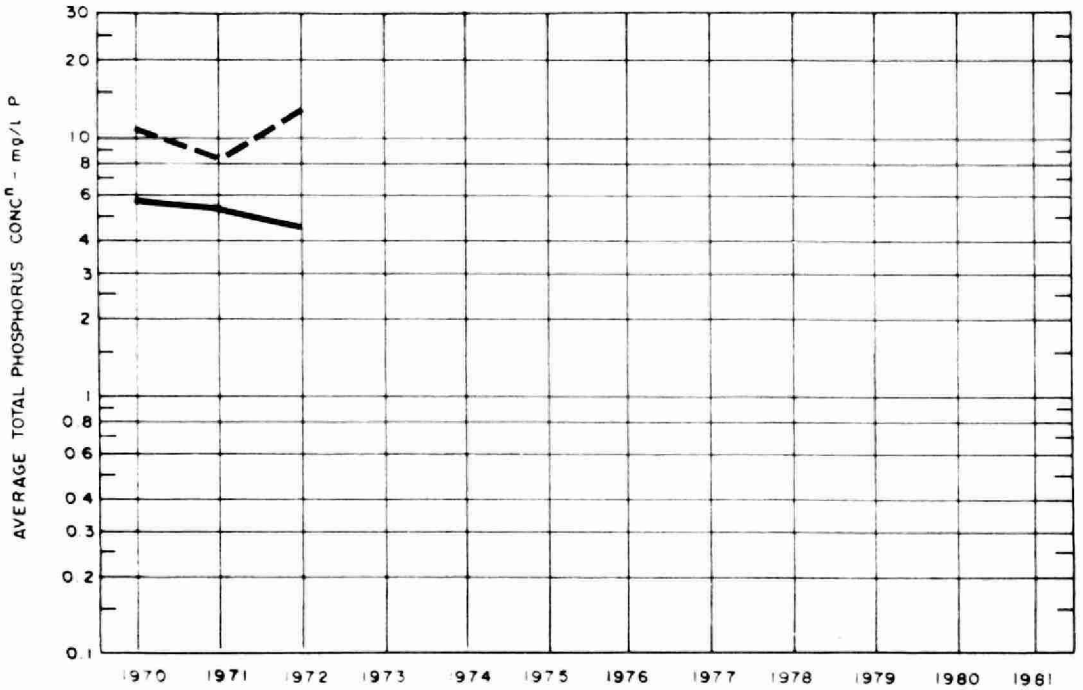




PLANT INFLUENT
PRIMARY EFFLUENT
PLANT EFFLUENT

PHOSPHORUS

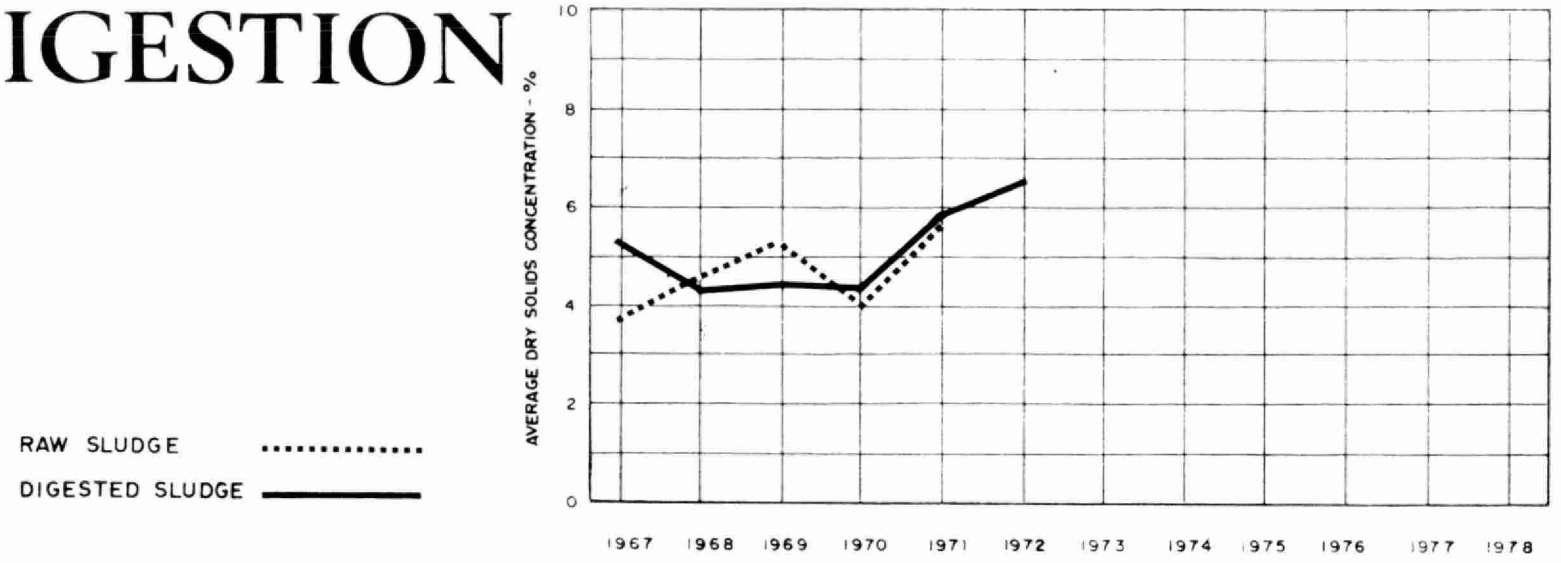


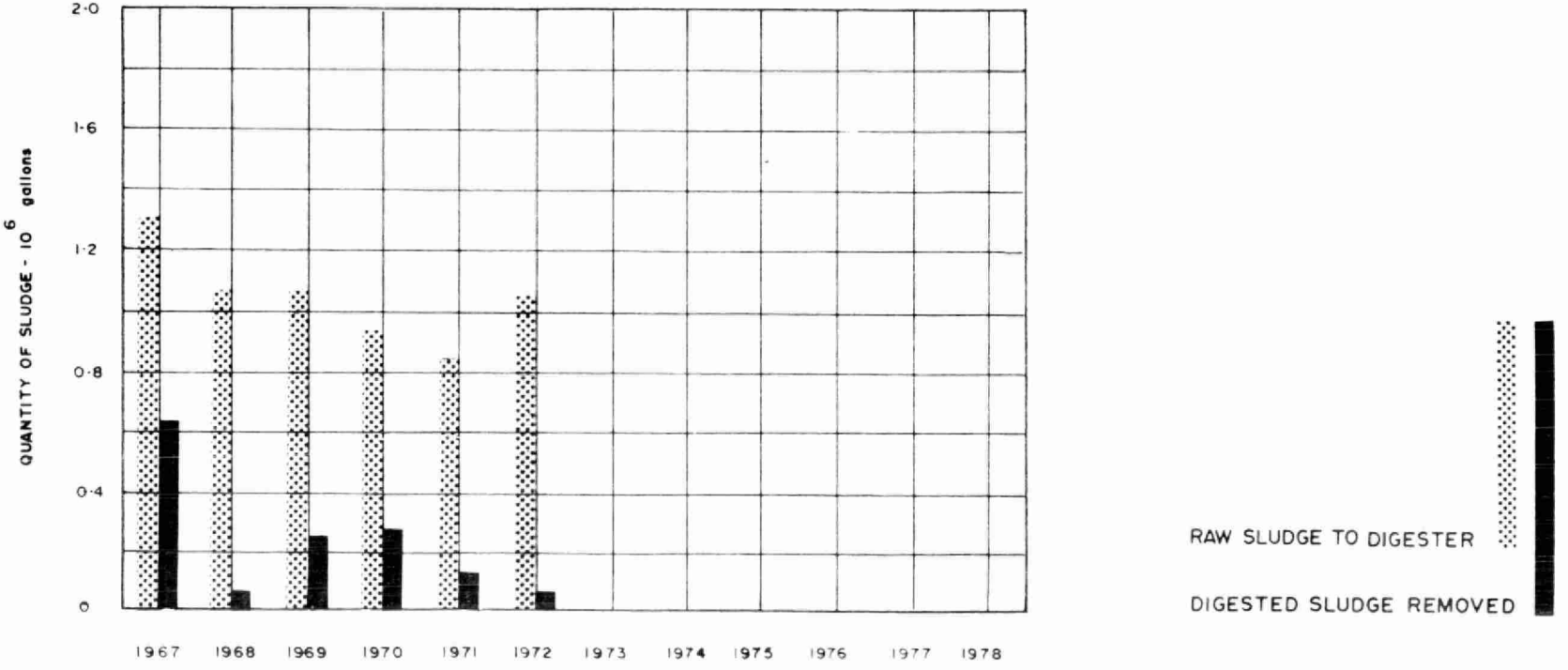


PLANT INFLUENT

PLANT EFFLUENT

DIGESTION


AVERAGE DRY SOLIDS CONCENTRATION - %
0
2
4
6
8
10
1967
1968
1969
1970
1971
1972
1973
1974
1975
1976
1977
1978
RAW SLUDGE
DIGESTED SLUDGE


QUANTITY OF SLUDGE - 10^6 gallons
0
0·4
0·8
1·2
1·6
2·0
1967
1968
1969
1970
1971
1972
1973
1974
1975
1976
1977
1978
RAW SLUDGE TO DIGESTER
DIGESTED SLUDGE REMOVED

TREATMENT DATA

MONTH	GRIT	CHLORINATION		PRIMARY EFFLUENT		AERATION			SLUDGE DIGESTION and DISPOSAL							
									RAW SLUDGE			DIGESTED SLUDGE			SUPER-	
	QUANTITY REMOVED cubic feet	Cl_2 USED 10^3 pounds	AVG. DOSE mg/l	BOD mg/l	SUSPENDED SOLIDS mg/l	MLSS CONC mg/l	F/M day^{-1}	AIR $\frac{1000\ ft^3}{lb\ BOD}$	QUANTITY 10^3 gallons	TOTAL SOLIDS %	VOL. SOLIDS %	QUANTITY 10^3 gallons	TOTAL SOLIDS %	VOL. SOLIDS %	NATANT T. S. %	AMOUNT HAULED cubic yards
JAN	94			183	173	1940	.47	1.8	72			12				
FEB	20			185	166	2040	.42	1.0	81			10				
MAR	36			224	194	1940	.67	0.6	94			6				
APR	80			95	65	1540	.45	1.2	88			14				
MAY	50	0.63	2.0			2170			95			10				
JUNE	15	1.12	2.3			1970			92			13				19
JULY	3	0.89	2.2			1970			88			26	6.5			152
AUG	30	1.16	2.6			1230			80			22	6.5		2.0	133
SEPT	30	1.06	2.8			1890			88			22	6.7			129
OCT	45	1.23	2.4			2010			90			34	7.6			201
NOV	40			175	160	2450	.44	.9	98			14	5.2		0.4	87
DEC	60			133	119	1140	.69	.9	81							
TOTAL	503	6.09	-	-	-	-	-	-	1047	-	-	183	-	-	-	721
AVG.	.9 cu.ft/mil gal	35lb/day	2.4	174	155	1860	.52	1.1	87			15	6.5		1.2	60

Chlorination Period May 11 - October 31